REMARKS

A first Office Action was sent on September 14, 2001. Applicants responded with an Amendment and Response filed on December 14, 2001. Applicants then received a Notice of Non-Compliant Amendment sent on January 28, 2002. This Substitute Amendment and Response is in response to the Notice of Non-Compliant Amendment and the Office Action sent on September 14, 2001 and thus replaces the Amendment and Response filed December 14, 2001.

Claims pending in the instant application are numbered 1-11. Claims 2 and 4-9 presently stand rejected under 35 U.S.C. §112. Applicants note with appreciation that claims 1, 3, 10 and 11 are allowed. Claims 4-9 have been canceled. Claim 2 has been amended and new claims 12-15 have been added. No new matter has been added. The Applicants respectfully request that the instant application be reconsidered in view of the amendments and following remarks.

Specification Objections

In the September 14, 2001 Office Action, the Examiner objected to the specification as containing numerous spelling and grammatical errors. The Examiner also objected to Claim 5 as being unsupported by the specification.

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Applicants submit that amendments to the specification filed in the December 14, 2001 Office Action were non-compliant as not being submitted in the format required under 37 CFR 1.121 as the amendments did not include a clean version of the replacement paragraph sections. Thus, in response to the Notice of Non-Compliant Amendment mailed on January 28, 2002, Applicants hereby submit clean versions of the replacement paragraph sections as shown above. The informalities have been corrected; no new matter has been added. Therefore, the Applicants respectfully request that the Examiner withdraw the objections.

Claim Objections

The Examiner objected to Claims 1-11 for numerous informalities. These informalities have been corrected as detailed above. Therefore, the Applicants respectfully request that the Examiner withdraw the objections.

Claim Rejections – 35 U.S.C. § 112

The Examiner rejected claims 2 and 4-9 under 35 U.S.C. § 112, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants note with appreciation for the indication that claims 2 and 4-9 would be allowable if rewritten or amended to overcome the above rejection. Accordingly, Applicants have amended Claim 2, deleted Claims

4-9, and added new Claims 12-15. Amended Claim 2 and new Claims 12-15 are believed to be allowable since they are based upon Claims 4-9.

In view of the remarks, Applicants respectfully request that the Examiner withdraw the rejection and expedite this application to issue.

Attached hereto is a marked up version of the changes made to the specification and claim by current amendment. The attached page is captioned "**Version with markings to show changes made.**"

Respectfully submitted,

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Date: 2·28·02

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on February 28, 2002
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Name of Person Mailing Correspondence

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Date

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Paragraph beginning at line 12 of page 1 has been amended as follows:

--Nano-tube field emission display comprises an image pixel array formed on a substrate having conductive patterned thereon as a cathode, and a corresponding phosphor pattern coated on an ITO glass as an anode. Each image pixel contains [containing] carbon nano-tube (hereinafter called CNT) layer thereon as electron emission sources. The CNT layer made of a slurry consists of organic bonding agent, silver powder, and CNT, which having 5-100nm in diameter and 1000-3000nm in length. The principle of field emission is in terms of electric field accelerating cold electron which is emitted is in terms of CNT through vacuum space and bombards anode which is an indium tin oxide (ITO) substrate having phosphor pixel to generate fluorescence. By contrast to conventional cathode ray tube which is in terms of thermionically emitted electrons emerge from a tungsten wire, the field emission modeling has quite different fashion.--

Paragraph beginning at line 1 of page 2 has been amended as follows:

--A typical field display schematic cross-sectional view is shown in Fig. 1. The figure shows a conductive line array 20 coated on a substrate 10 by screen-printing a conductive slurry containing silver through a

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line-patterned screen. Thereafter, a CNT layer is attached thereon by screen-printing a CNT paste through a mesh patterned screen to form image pixel [layer30] layer 30. The CNT past consists of organic bonding agent, resin, carbon nano-tubes, and silver powder. After that the substrate is soft baked in an oven using a temperature of about [50 – 200] 50–200 °C to remove volatile organic solvent. Finally a higher temperature sintering process is carried out to cure the CNT on and to electric coupled with the conductive silver lines. In the sintering process, all of the organic bonding agent and resin are burned out.--

Paragraph beginning at line 24 of page 2 is amended as follows:

--Since the electric property (current density vs. intensity of electric field) is predetermined by a number of exposed CNT, which should be electric coupled with the conductive layer 20 of the cathode. However aforementioned CNT field emission device of prior art in general emits very low current density unless using extra processes and/or [user] using high electric field intensity. Please refer to Fig. 2, showing a curve 110 by using conventional process and another curve 120 in accordance with the present invention. In figure, the current density versus electric field is shown. The conventional process has a current density lower than 1 mA/cm^2 for intensity of electric filed of about 6V/μm. To achieve 1-100 mA/cm^2 in current density emission exerting [a] rather high electric field intensity is usually expected.--

Paragraph beginning at line 11 on page 3 is amended as follows:

--Thus, as acquired knowledge known by the inventor, none of issued invention discloses a CNT emission display, which can approach the goal of producing the critical current density in the electric field intensity as low as 6V/μm. U.S. Patent Number 5, 616,368, issued to Jim, et al., disclose a patent about field emission display. Jim, et al. proposed [hat] <u>that</u> using activated ultra-fine diamond particulate as emission sources for field emission source can significantly improving the prior art of their patent. As stated in Jim's patent, ultra-fine diamond particulate has a low or negative electrical affinity, and thus can act as field emitter in low electric field. An electric field of more than 70V/μm is needed for typical p-type doped diamond substrate to generate an emission current density of 10 mA/cm^{2}. In Jim's patent, a field of a bout 12V/μm or even down to 5V/μm <u>is required</u> to achieve the <u>critical</u> [minimum] current density.--

Paragraph beginning at line 24 on page 3 is amended as follows:

--The method of Jim, et al comprises the following steps. First, diamonds, predominantly having maximum dimensions in the range of 5-10,000 nm are prepared. Prior to paste the particulate emitters to the substrate, the ultra-fine particles are exposed in a plasma containing hydrogen at a temperature in excess of 300 °C. In order to minimize agglomerations of the particles during the plasma activating processing

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and in order to have relative uniform activation on major part of the exposed diamond surface, the particles in continuous motion by injecting high speed gas flow is performed. In addition, the diamond particles have less than 10 volume percent of graphitic or amorphous carbon phases. Thereafter the diamonds particles with bond agent are mixed and screen-print to a predetermined conductive trace containing substrate. Finally, a sintering process at a temperature of about 500 °C is [perform] performed to form pixels.--

Paragraph beginning at line 12 on page 4 is amended as follows:

--As forgoing prior art, for CNT there is not available method present to improve the problem of the high electric filed needed [except] unless using the ultra-fine diamond particles. In addition, the method to alleviate agglomeration of the particles proposed by the prior art is done before pasting on the conductive layer. Consequently, whether agglomerated again after slurry prepared and sintering process is not sure. Thus the present invention is to improve the CNT field emitter. Furthermore, CNT field emitter improvement by the present invention has [lowed] lower cost and easily to implement.--

Paragraph beginning at line 1 on page 5 is amended as follows:

--The present invention discloses a method of CNT emitter current density improvement by a taping process. The method comprises

following steps. First of all, a conductive pattern coated on a substrate by screen-printing a conductive slurry containing silver through a patterned screen is carried out. Thereafter, a CNT layer is attached thereon by screen-printing a CNT paste through a mesh pattern screen to form CNT image pixel array layer. The CNT paste consists of organic bonding agent, resin, silver powder, and carbon nano-tubes. After that the substrate is soft baked by an oven using a temperature of about 50-200 °C to remove volatile organic solvent. A higher temperature sintering process, for example 350-550 °C is then carried out to solidify the CNT on and electric coupled with conductive pattern. Finally, an adhesive film is closely attached on the cathode substrate and then remove the adhesive film away so as to [then remove] <u>is then removed</u> those badly bonding CNT portion and to vertically pull up a portion of CNT which originally laid down on the surface after sintering. Consequently, the current density, brightness, and uniformity of the emitter sources are significantly improved.--

Paragraph beginning at line 5 on page 7 is amended as follows:

--Hence, the inventors propose following processes.

In a preferred embodiment, the CNT layer formed is carried out as aforementioned background of the invention. After screen print, the conductive line array of about 50-150μm in interval and 150-300μm each in width is formed. Each of the field pixel is about 0.02-0.09 mm^2

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are formed. The soft baked temperature is about 50-200 °C to remove away organic volatile solvent. A taping process is performed by using adhesive film such as tape with adhesive material thereon or polymer film with static electrical attractive material on the CNT substrate through a laminator to closely attach on the CNT layer and the adhesive film <u>or the polymer film</u> are pulled up and removed away. The process can remove some badly attached CNT. Some of the CNT buried in the CNT layer is also pull up to a proper direction.--

Paragraph beginning at line 1 on page 8 is amended as follows:

--Fig. 2 shows a comparison of curves 110 and 120 of current density vs. electric field intensity for a CNT field emitter formed by a conventional method without taping process and formed by the present invention (the conventional method but associate with taping process, respectively). With taping process, the current density [come up to over] <u>is found to be higher</u> than 10 mA/cm^2 for electric field intensity of about $5V/\mu m$. However, without taping process, the current density is still lower than 1 mA/cm^2 even for electric field intensity of about $6V/\mu m$. The result shows the present invention has protruding effect.--

Paragraph beginning at line 10 on page 5 is amended as follows:

--Fig. 3 shows a cross-sectional view of CNT emitter pixel without taping process to the CNT cathode, [investigating] <u>inspecting</u> by scanning

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using electron microscope. Fig. 4 shows a cross-sectional view image with a taping process to the CNT cathode. By comparing Fig. 3 with Fig. 4, the CNT layer for taping CNT emitter pixel is thinner than that of without taping. It proves that a portion of the CNT layer with badly attached on cathode is removed through the taping process. In addition, some of the buried CNT emitter sources can also be pulled up to a proper directionally.--

Paragraph beginning on line 19 on page 5 is amended as follows:

--The present invention provides the following benefits:

(1) The current density of CNT emitter source can be significantly [increase] <u>increased</u> at low electric field intensity without complicated process but by a simple taping process.--

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14. (New) The method according to claim 1, wherein said step of performing a taping process is done by (1) press printing an adhesive film to a surface of said CNT layer and (2) pulling said adhesive film up and stripping away said adhesive film.

15. (New) The method according to claim 1, wherein said step of performing a taping process is done by (1) press printing a film which has a static electric attractive material formed thereon on a surface of said CNT layer by using a laminator and (2) pulling said film up and stripping away.